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Tulsa Tornado Tribune

Where People Who Know the Weather Get Their Weather

National Weather Service Tulsa, Oklahoma — Spring, 2007

Historic Ice Storm of January, 2007

For the second time in a two month period, eastern Oklahoma and northwest Arkansas were pummeled by a major winter storm. This time, ice was the culprit, leaving tens of thousands without power for several days, and causing millions in damage.

In an area not known for harsh winters, a winter storm such as the "*Blizzard of '06*" was a remarkable storm. Six weeks later, most areas had recovered well from that storm...but by Sunday morning, January 7, NWS Tulsa forecasters began to see strong potential for another significant winter storm by week's end.

The aftermath of the ice storm near Gravette, Arkansas

The upper level pattern had begun to suggest the development of a deep trough in the western United States, while another arctic cold front was poised to move in. This scenario was not unlike the one that led to the late November snowstorm, but the type of precipitation still hinged on the depth of the arctic air. Early indications pointed toward freezing rain for much of the area by the next weekend.

As forecasters continued to monitor incoming data, the potential for significant ice appeared greater across northeast Oklahoma, while heavy rain was becoming a concern further south. By Wednesday morning, it was apparent that at least part of the area would see significant ice, and this was mentioned in the afternoon Hazardous Weather Outlook. Heavy precipitation was likely, but what type would depend on exactly where the freezing line would be.

More about the storm is on pages 2 and 3:

Warnings to Become Storm-Based

Short-fused weather warnings, such as severe thunderstorm and tornado warnings, have long been issued for entire counties, while the actual storm affected only a small percentage of the county. Technological advances in recent years have allowed forecasters to warn for more specific areas by drawing warning polygons based on the size and expected movement of a particular cell (or line of storms), but the official warning has remained valid for the entire county which is covered by any portion of the polygon. Starting this fall, the National Weather Service plans to make the polygon, or storm-based warnings official.

The plan is to officially replace county based warnings with storm-based warnings on October 1, 2007. The NWS

(**Warnings** *Continues on page 4)*

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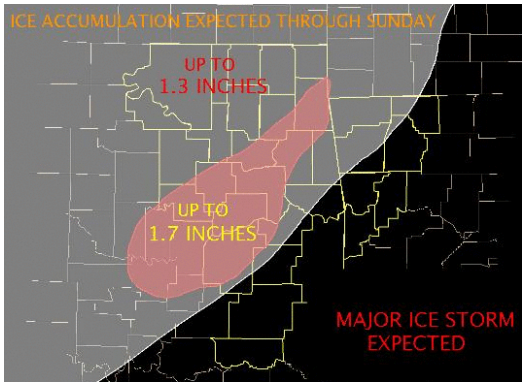
January, 2007 Ice Storm - Review



Ice Accumulation forecast from NWS Tulsa, issued Thursday evening, January 11.

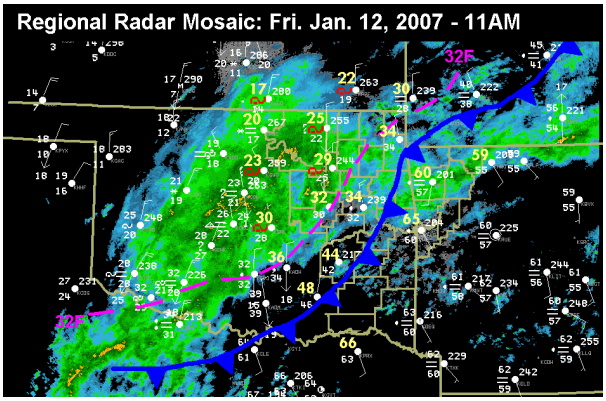
Issuing the Watch and Warning

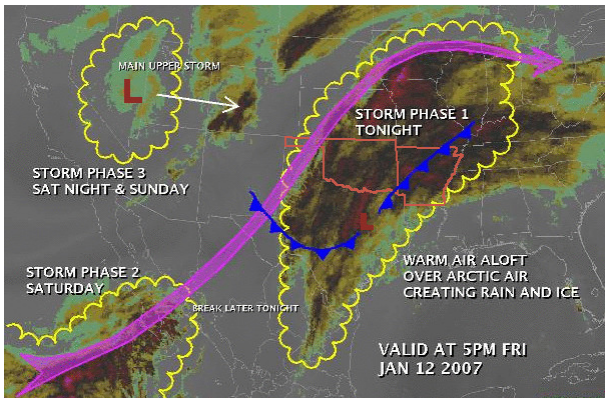
With the early morning forecast Thursday, a Winter Storm Watch was issued for the period Friday afternoon through Sunday, covering much of eastern Oklahoma and northwest Arkansas. Latest data at this time indicated that ice accumulation could occur farther south than previously thought. Confidence was high that the event would be either rain or freezing rain, with little threat for significant snow.

The Winter Storm Watch was upgraded to a Winter Storm Warning Thursday afternoon, and the change was already on the horizon. While eastern Oklahoma and northwest Arkansas were enjoying temperatures in the 60s, the cold front had already brought sub-freezing temperatures to northwest Kansas and was poised to arrive in northeast Oklahoma by early Friday morning. Ice accumulations of over 1.5 inches were now forecast through a swath of eastern Oklahoma.

First Wave Hits

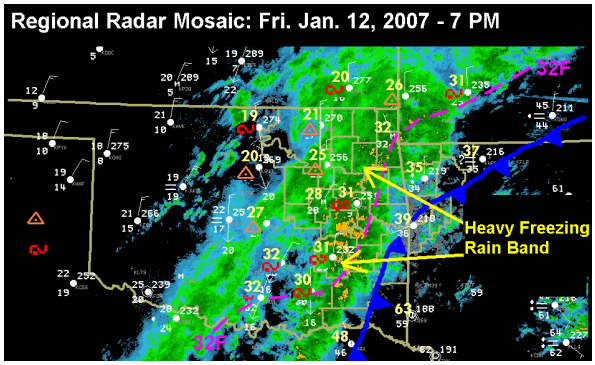
The cold front plunged into northeast Oklahoma early Friday morning as expected, and by 8 am, was just south of Interstate 44. By this time, areas of freezing rain and sleet were developing north of the front in response to an approaching disturbance, and travel was already becoming hazardous. The front continued to sag south through the morning, and by 11 am, the freezing line had reached near an Okemah to Miami line. Freezing rain changed to sleet from the Tulsa metro area northward shortly thereafter. This ultimately spared these areas from the major ice storm damage.





While the main upper low remained over the Great Basin Friday evening, a strong upper level disturbance moved out ahead of the low and continued to produce widespread precipitation across the area. By early evening, the front had pushed through all but far southeast Oklahoma and the Arkansas River valley of west central Arkansas, with freezing temperatures now everywhere north of a McAlester to Grove line. By this time, freezing rain had changed to sleet along and north of Interstate 44. While a break was anticipated later that night, a second wave could be seen off the Baja coast, which would bring the second round of winter weather on Saturday.

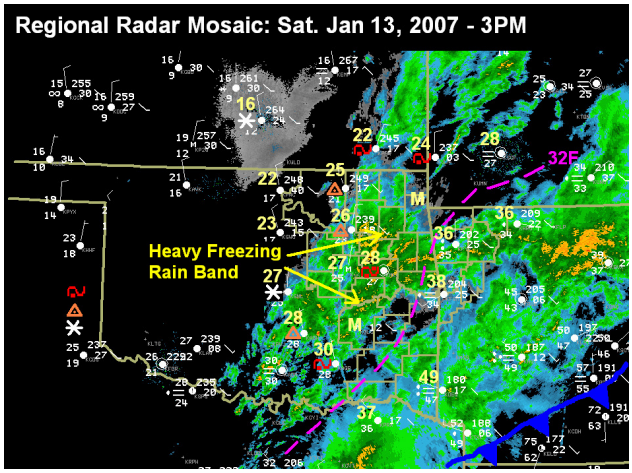
Concern for a devastating ice storm was growing as a band of moderate to heavy freezing rain developed from near McAlester to Pryor, bringing the initial bout with damaging ice accumulations. Widespread power outages were already occurring, with about 7000 customers without electricity in McAlester alone. To make matters worse, two more waves were poised to move through over the weekend. Governor Brad Henry declared a state of emergency for all counties in Oklahoma in anticipation of more ice.

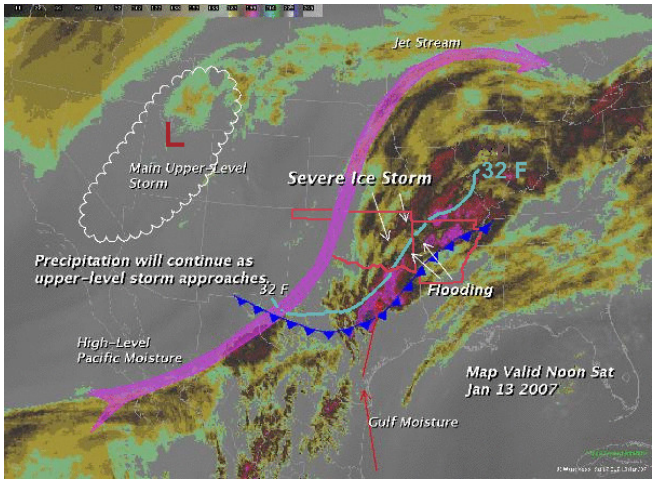


January, 2007 Ice Storm - Review

Round Two

Following a brief lull in the activity Friday night, the second upper level wave moved through the area and spread more freezing rain and sleet north of the front by late Saturday morning. The cold front had pushed well south and east of the area, and freezing temperatures had now reached into extreme northwest Arkansas, with significant icing across much of Benton County.





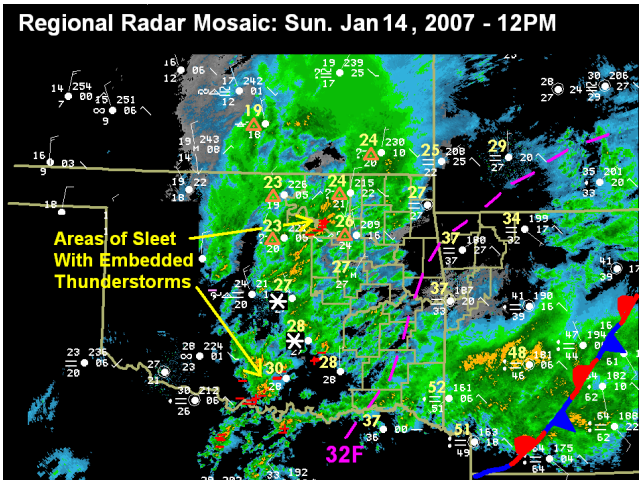
Unfortunately, another moderate to heavy band of freezing rain, including a few embedded thunderstorms, developed in almost the same location by Saturday afternoon, creating more problems in an area already suffering from extensive damage and power outages. The second round of precipitation finally ended from the west by Saturday evening. But the event was far from over, as the main upper low was now beginning to track east and would bring yet another round of ice and sleet.

The Final Blow

By Sunday morning, almost 100,000 customers in Oklahoma were without power, and several highways were closed due to ice or to fallen trees. The Red Cross had begun to set up emergency shelters in many communities. The NOAA Weather Radio transmitters and automated weather observing stations at both Muskogee and McAlester had lost power.

Though it was far from over, it was apparent that the impacts of this storm would rival, or even exceed, those from the December, 2000 storm. One to three inches of ice had accumulated in an area from McAlester into the extreme northwest corner of Arkansas.

Sunday morning began with another short break, but the main upper low was already near the Arizona-New Mexico border. The next round of precipitation was breaking out over far western Oklahoma...again with embedded thunderstorms. Freezing rain and thunderstorms moved into eastern Oklahoma by mid morning, only adding to the misery. Periods of heavy sleet and freezing rain continued Sunday afternoon, before finally ending for good that evening.



The Aftermath

In the storm's wake, tens of thousands of residents across eastern Oklahoma and Benton County, Arkansas, remained without power. A few communities even experienced interruptions in water service. It was clear that the impacts of this storm would linger for weeks, or even months.

Needless to say, the clean up efforts following this ice storm were tremendous. Gradually, power was restored to area homes and businesses, but in some areas, that process took over two weeks. Ultimately, 25 counties in Oklahoma were declared eligible for federal disaster relief. Preliminary figures indicate a total of nearly 40 million dollars in damages were incurred as a result of the ice storm.

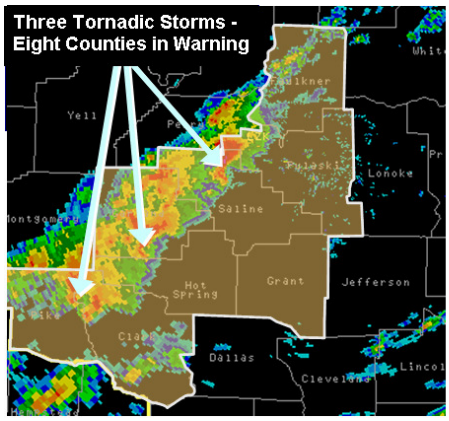
Warnings

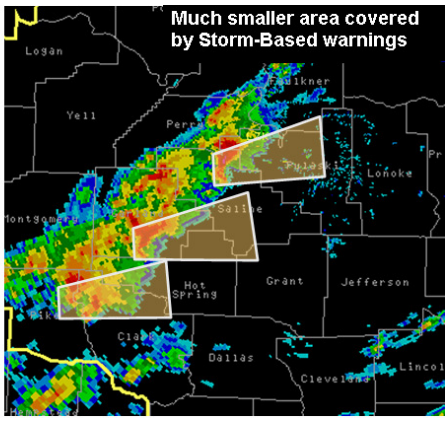
(Continued from page 1)

will continue to gather feedback from partners and customers, from now until well beyond initial deployment. This planned change will not work unless it works for the private sector vendors of NWS warnings, emergency managers, and the media.

A test of storm-based warnings in 2005 actually showed that warning area could be reduced by around 70 percent. There are several other benefits to going to storm-based warnings, including increased specificity and clarity with the warning. The more geographically based warnings are supported by new dissemination technologies.

With storm-based warnings, new siren systems can be selectively activated for just those communities that are directly threatened. A study done by Dr. Dan Sutter, a professor of Economics at the University of Oklahoma and now the University of Texas Pan-Am, found that storm-based warnings could save the public a minimum of $100 million dollars a year in reduction of the cost of sheltering.





Here is an example from central Arkansas to illustrate some of the benefits of going from county-based warnings to storm-based warnings. In this case, there were actually three significant tornadoes on the ground at the same time. Eight counties were covered by tornado warnings, with almost a million people warned. With storm-based tornado warnings only those areas that are directly threatened are in the warning, not the entire county. In this case, 70 percent less area was covered by warnings, and approximately 600,000 fewer people would be encouraged to take cover.

Local News

Bronze Medal Recipients!

The National Weather Service office in Tulsa has been awarded a Department of Commerce Bronze Medal Award for providing critical forecasts and specialized support during a severe fire weather episode in eastern Oklahoma on November 27 - 30, 2005. The awards will be presented along with the Distinguished Career Awards at a ceremony to be announced at a later date.

Retirement

Senior Forecaster Richard Uber recently retired after 35 years of federal service, including four years in the United States Air Force. Richard was one of the original forecasters who arrived in Tulsa back in 1990 at the beginning of the spin-up to forecast office status. Good luck Rich...we know you'll miss those midnight shifts!

Decision Support Update

A small change has been made to the Decision Support page. The thresholds for severe weather in the extended periods (days 2 through 7) have been redefined as follows;

none	<11 %	elevated	31-60%
limited	11-30 %	significant	>60 %

New Event Planner

If you haven't noticed already, a new Event Planner has been added to the NWS Tulsa webpage. The page provides climatological information for Tulsa, Fort Smith, McAlester and Fayetteville, including temperature normals, sunrise and sunset times, record highs and lows, and climatological odds of precipitation for any day of the year. Simply click on a particular date on the calendar to access this information. While this is not intended to be used as a weather forecast, it can be useful for planning of activities such as outdoor parties or weddings.

Enhanced Fujita Scale

The National Weather Service has implemented the "Enhanced Fujita (EF) Scale" to rate tornadoes in a more consistent and accurate manner. The original Fujita Scale has limitations, such as a lack of damage indicators, no account for construction quality and variability, and no definitive correlation between damage and wind speed. These limitations may have led to some tornadoes being rated in an inconsistent manner and, in some cases, an overestimate of tornado wind speeds. The EF Scale will still rate tornado categories from zero to five, but the ranges of wind speed in each category are now more accurate.

Original Fujita Scale		Enhanced Fujita Scale	
Rating	Speed	Rating	Speed
F0	45-78	EF0	65-85
F1	79-117	EF1	86-110
F2	118-161	EF2	111-135
F3	162-209	EF3	136-165
F4	210-261	EF4	166-200
F5	262-317	EF5	>200

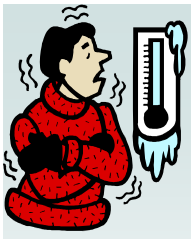
Researchers wanted the tornado database to be preserved; therefore, they developed a correlation between the EF Scale and the original F Scale. The basic wind speed ranges in the EF Scale are derived from the original F Scale. A tornado with damage rated F3 in the past will still be classified as EF3 in the future. The wind estimates, though lower, are more accurately estimated now. The EF Scale takes into account more variables than the original F Scale did when assigning a wind speed rating to a tornado. The EF Scale incorporates 28 damage indicators (DIs) such as building type, structures, and trees. For each damage indicator, there are 8 degrees of damage (DOD) ranging from the beginning of visible damage to complete destruction of the damage indicator. The original F Scale did not take these details into account.

More information on the EF Scale can be found by visiting the Storm Prediction Center website.

http://www.spc.noaa.gov

For example, an EF3 tornado will have estimated wind speeds between 136 and 165 mph, whereas with the original F Scale, an F3 tornado has winds estimated between 162-209 mph. The wind speeds necessary to cause "F3" damage are not as high as once thought and this may have led to an overestimation of some tornado wind speeds. There is still some uncertainty as to the upper limits of the strongest tornadoes, so EF5 ratings do not have a wind speed range. Wind speed estimations for EF5 tornadoes will be left open ended and assigned wind speeds greater than 200 mph.

The NWS is the only federal agency with authority to provide "official" tornado EF Scale ratings. The goal is to assign an EF Scale category based on the highest wind speed that occurred within the damage path. First, trained NWS personnel will identify the appropriate damage indicator (DI) from more than one of the 28 used in rating the damage. The construction or description of a building should match the DI being considered, and the observed damage should match one of the 8 degrees of damage (DOD) used by the scale. The tornado evaluator will then make a judgment within the range of upper and lower bound wind speeds, as to whether the wind speed to cause the damage is higher or lower than the expected value for the particular DOD. This is done for several structures not just one, before a final EF rating is determined.



So, How Cold Was it?

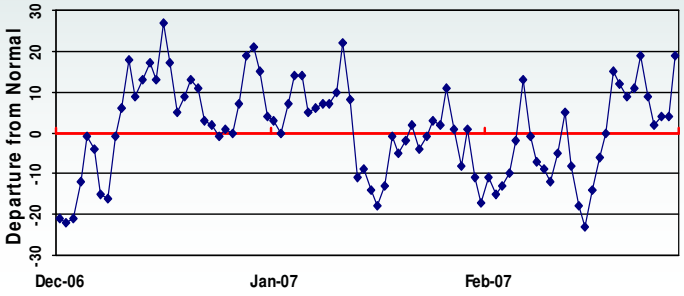
Now that the winter of 2006-07 is (climatologically speaking) over, we can ask; "Was this winter unusually cold?"

The answer may surprise some. The average temperature for December through February, the "official" winter season, at both Tulsa and Fort Smith turned out to be slightly **above** normal!

So, why then, did this winter seem so cold? The answer mainly lies in a particular five week period from mid-January through mid-February (see the temperature graph), when temperatures remained several degrees below normal for a prolonged period. This is indeed an unusual occurrence in this part of the world. Also, the snow and ice that did fall tended to stay on the ground for a number of days as each time it was followed by a prolonged cold spell.

What we really saw, then, was an very unusual stretch buried within a rather "average" season!

Tulsa Departure from Normal Temperature Winter 2006-07



Another County Declared StormReady

On March 9th, the National Weather Service in Tulsa formally recognized Washington County, Arkansas, as the nation's newest StormReady County. The announcement was made at a news conference held at the Washington County Emergency Operations Center in Fayetteville. Washington County joins seven other counties and three communities in Arkansas with the StormReady designation. Other StormReady designations in northwestern Arkansas include Benton County, Franklin County, Sebastian County, and Siloam Springs. Washington County became the 30th StormReady designation in the NWS Tulsa CWA, the eighth StormReady County in Arkansas, and the 1152nd designation in the country.

From left to right: Washington County Judge Jerry Hunton, Washington County Emergency Management Director John Luther, Washington County Administrator John Gibson, WFO Tulsa MIC Steve Piltz, and WFO Tulsa WCM Ed Calianese. (photo by Al Hong, WFO Tulsa Service Hydrologist)

The Washington County EOC was moved to its new location last year, with significant upgrades made in their communication capabilities. In the coming months, the University of Arkansas will move their emergency operations to the Washington County EOC.

Storm Spotting in the Dark

Perhaps one of the most dangerous aspects of spotting storms is that sometimes it has to be done after dark. Eastern Oklahoma and western Arkansas are somewhat prone to tornadoes after dark, as storms that develop to our west late in the afternoon move east during the evening. Needless to say, darkness brings a whole new challenge to visually detecting severe weather without getting caught up in it. However, there are a few visual clues you can look for in the flashes of lightning that accompany the storm.

Developing tornado in Delaware Co. March 12, 2006. Key features such as the wall cloud can be seen, but only briefly. Rotation can be inferred by other features, such as cloud striations.

Of course, lightning is both good and bad for night spotting. Aside from the obvious danger of being struck, too little may not yield enough timely light for you to identify the features associated with a developing tornado. Too much can have a strobe effect and seriously hinder your night vision. Depth perception is very difficult near thunderstorms at night, and makes judging distances very difficult. Add that to the fact that nearly every piece of scud cloud can look like a funnel cloud in the dark. Knowing your position in relation to the storm is absolutely critical for your safety and to have a good idea of what direction in the storm you might want to be looking.

Another possible source of light comes from power flashes. Once you have seen a power flash at night, you know they are unmistakable. These are caused from power lines breaking, coming in contact with one another or the ground, and sometimes by lightning striking a transformer. While they are not necessarily always caused by a tornado, if you see multiple power flashes, especially in a populated area, it is reasonable to conclude that a tornado is present.

Tornado near Depew, OK May 29, 2004. The power flash not only illuminates the funnel, but confirms it is indeed a tornado on the ground.

Above all, the most important thing is to keep yourself safe. Stay out of the precipitation as it will effectively blind you from seeing anything. Pay VERY close attention to what is going on around you and keep your attention on what you are out there for. It is best not to try storm spotting at night alone, nor should you attempt night spotting until you have plenty of daytime spotting experience and feel comfortable being around a storm and identifying all it's visual clues.